DOCUMENT RESUME

ED 086 323 PS 006 934

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TITLE Relationships Between Neonatal Characteristics and Mother-Infant Interaction.
INSTITUTION Temple Univ., Philadelphia, Pa.
SPONS AGENCY Health Services and Mental Health Administration (DHEW), Bethesda, Md.
PUB DATE Mar 73
NOTE 19p.; Revision of paper presented at the Biennial meeting of the Society for Research in Child Development (Philadelphia, Pa., March 29 - April 1, 1973)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Behavior Development; *Behavior Patterns; Correlation; *Infants; Interviews; Measurement; *Mothers; Observation; Parent Attitudes; *Parent Child Relationship; Parent Influence; *Social Development
IDENTIFIERS Brazelton Neonatal Assessment Scale; *Neonatal Style

ABSTRACT

A total of 51 mothers and their newborn infants were studied in order to evaluate the relationship between neonatal style and the early mother-infant relationship. The procedure included an infant assessment with the Brazelton Neonatal Assessment Scale, a mother-infant interaction observation during feeding, and an interview concerning maternal attitudes and perceptions. The findings suggest that there are consistencies in infant state and behavioral measures across situations. The data also suggest consistent and interactive relationships between patterns of maternal stimulation and infant behavior in corresponding areas. For example, the attentive, sensitive mother tends to have a responsive baby and vice versa. The findings provide additional meaningful information about the early development of the complex relationship between children and parents. (Author/SET)

Relationships between Neonatal Characteristics and Mother-Infant Interaction[1]

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Revision of paper presented at biennial meeting of Society for Research in Child Development, Philadelphia, 1973. Submitted for publication.

Fifty-one mothers and their newborn infants were studied in order to evaluate the relationship between neonatal style and the early mother-infant relationship. The procedure included an infant assessment with the Brazelton Neonatal Assessment Scale, a mother-infant interaction observation during feeding, and an interview concerning maternal attitudes and perceptions. The findings suggest that there are consistencies in infant state and behavioral measures across situations. For example, the infant who is alert and responds to auditory cues during the Brazelton Assessment, looks at the mother a great deal during the feeding observation. The data also suggest consistent and interactive relationships between patterns of maternal stimulation and infant behavior in corresponding areas. For example, the attentive sensitive mother tends to have a responsive baby and vice versa. The findings provide additional meaningful information about the early development of the complex relationship between children and parents.

Relationships between Neonatal Characteristics and Mother-Infant Interaction

In observational studies of mother-infant interaction, investigators have attempted to determine the kinds of behaviors exhibited by either the mother or infant, and the ways in which they might contribute to the relationship. Although relatively few studies have been carried out to investigate this area, some of those which have been done have demonstrated that age, sex (Moss, 1967; Lewis, 1972), social class (Tulkin and Kagan, 1970; Lewis and Wilson, 1972), and emotional factors (Levy, 1958; Davids, 1968) affect the mother-infant relationship. There is a continually growing body of data which indicates that the state of the infant may have important influences on mother-infant interaction (Moss, 1967; Brown, 1964; Escalona, 1962; Levy, 1958; Caldwell, 1964; Yarrow and Goodwin, 1965; Ashton, 1973; Lewis, 1972). The relationship also is affected by the parity of the infant, i.e., whether it is a first or later-born child (Thoman, et al, 1970; 1972).

Osofsky (1971) and Osofsky and O'Connell (1972) developed designs to evaluate the effects of children on parents. It was demonstrated that children affect parents' behaviors just as parents influence children's behaviors, and, therefore, it is probably most meaningful to understand the process as an interactive one. With infants, methods of determining individual differences in behavior and their effects on adults are needed. For this reason, extensive neonatal assessments have been done as a first step in attempting to better define parameters for investigating the contribution of the infant to the interactive relationship.

The Brazelton Neonatal Behavioral Assessment Scale (1972) allows for the evaluation of infants in areas which are likely to be related to the early mother-infant relationship. Dimensions assessing infant activity, state and state changes, general style, social responsiveness and reactions to visual, auditory, and tactile stimulation are included. While some studies have been reported concerning the usefulness and validity of the scale (Horowitz, et al, 1970), little work has been done concerning the relationships between infant style, as evaluated by the Brazelton Scale and the early mother-infant relationship. Data also has not been available from a low income, non-white sample, such as the one included in the present investigation.

The purpose of the present study was to evaluate the relationships between neonatal style and the early mother-infant relationship. A secondary purpose was to determine the relationship between mothers' perceptions of their infants, and their behaviors in a mother-infant interaction situation. A further issue was to identify parameters which might be of help in better understanding how the particular style of the infant contributes to the mother-infant relationship.

Method

Subjects

The subjects were 51 mothers and their newborn infants. Subjects were randomly sampled from the population born at Temple University Hospital in Philadelphia. All subjects were non-white and of lower socio-economic status. All infants were between 2 and

4 days old when included in the study. Mothers ranged in age from 15 - 39 ($\bar{x}$ = 21.1). Fifty-one percent of the patients were primiparous, and 49% were multiparous. The sample included 32 boys and 19 girls. No attempt was made to sample the population selectively since the range of behaviors occurring in the mother-infant relationship was of most interest.

Procedure

The subjects were approached while they were in the hospital and asked if they would be willing to participate in a study about mothers and their infants. (Twenty-four of the mothers had participated in another project prenatally involving obstetrical parameters which might be expected to be related to subsequent infant development. As many of them as possible were included in this study in order to have and utilize the additional information.) Mothers were told that they would be observed feeding their infants and that they would be interviewed about childrearing. They also were informed that their infants would be evaluated developmentally. If they agreed to participate, convenient times were arranged to carry out the procedures. The interview always followed the observation in order to minimize the subject's desire to talk to the examiner while being observed. Two women who were approached refused to participate in the study. Another 2 women who initially had agreed to participate refused to finish the interview when they were informed that it would take approximately 1½ hours.

Behavioral Observations

Mothers and infants were observed for about 15 minutes during a scheduled feeding time. All mothers in the sample were bottle

feeding. (It was decided to eliminate breast feeding mothers from the sample since there were so few that it would not have been possible to have a sufficient number for comparison purposes.) After the observer watched the mother feeding the infant, ratings were made on dimensions designed to tap the interactive relationship. Mothers were rated for attentiveness and general sensitivity, frequency and quantity of auditory, visual, and tactile stimulation, facial movement, and the position in which the baby was held. Infants were rated for initial and predominant states during the feeding, eye contact with mother, response to auditory, visual, and functional and non-functional tactile stimulation.[3] Interrater reliability was established on a sample of infants before the study began and ranged from .88 to .99 on the various dimensions which were utilized. After reliability was established, observations were done by 1 observer with periodic checks by 2 observers. This method has been demonstrated to be one that maintains high reliability.

Interview

Subjects were interviewed following the behavioral observations. The interview included material concerning attitudes toward child-rearing, perceptions of the baby during feeding, and general feelings about the baby. It also included information about experiences which are important for infant development. The data from this part of the study will be presented at a later time.

Neonatal Evaluations

Infants were evaluated between 2 and 4 days of age using the Brazelton Neonatal Assessment Scale (Brazelton, 1972). Assessment with the Brazelton Scale includes an evaluation of infant reflex

behavior, habituation to auditory and visual stimuli, social responsiveness, activity, and general style of responding. To optimize responsiveness, each baby was tested in a quiet room adjacent to the nursery between 1½ and 2 hours after feeding.

Results

Before presenting the relationships between neonatal style and mother-infant interaction, it would seem important to share the normative data from this sample, since the sample is from a group which is somewhat different from those which have been studied previously. Table 1 presents the means and standard deviations of selected medical variables, Table 2 of Brazelton variables, and Table 3 of variables for the mother-infant interaction sessions which might be expected to be of special interest in relation to infant style and mother-infant interaction.

Table 4 presents relationships between Brazelton dimensions and observed infant behaviors. As can be seen, there are a number of interesting relationships between infant characteristics, as determined by the Brazelton assessments, and their observed behaviors during the mother-infant interaction situation. The predominant state of the infant during the interaction situations is related to infant state during the neonatal assessment. The predominant eye contact of the infant with the mother during the interaction situation is related positively to a number of neonatal assessment variables, including: initial and predominant state, orientation to animate and inanimate visual and auditory stimuli (ball, rattle, face, and face and voice), alertness, consolability, irritability, and hand-to-mouth contact.

The predominant auditory responsivity during the interaction situation is related positively to several variables, including: initial and predominant states, pull-to-sit response, defensive movements, consolability, peak of excitement, activity, lability of states, self-quieting behavior, and hand-to-mouth contact. The infant's total tactile responsivity during the interaction situation is related negatively to: cuddliness, rapidity of build-up to excited state, lability of states, self-quieting behavior, and hand-to-mouth contact.

Table 4 presents the relationships between the infant and maternal behaviors observed during the interaction situation. Maternal attentiveness and sensitivity toward the infant are related to infant visual, auditory, and tactile behaviors. The mother's auditory stimulation is related to the responsiveness of the infant in the auditory domain. The mother's visual stimulation is related positively to the infant's auditory and tactile responsivity. The mother's tactile stimulation of the infant relates to the infant's responsivity in the visual, auditory, and tactile domains. In sum, there appears to be a strong interrelationship between the mother's stimulation in a particular domain and the neonate's responsivity in that domain as well as others. The one area in which there seems to be greatest specificity in maternal and infant behavior during the interaction is in the auditory domain. The only behavioral variable relating to sex of the infant was auditory responsivity with males responding more during the mother-infant interaction session.

Discussion

In attempting to understand the parent-child relationship, it

is becoming increasingly apparent that one must focus upon infants as well as children, and must consider the role of the child as well as that of the parent. The present study has attempted to better define and examine the relationships between neonatal characteristics and mother-infant interaction.

One of the most important findings emerging from the behavioral data is that there seems to be similarity in infant style across situations. Infant state and responses, during Brazelton Neonatal Assessments, relate to observed behaviors during a subsequent observational mother-infant interaction situation. Further, the relationships demonstrate logical patterns, suggesting considerable consistency of state and behavioral measures across situations, at least during the time interval under consideration. For example, the dominant state during the Brazelton Assessments relates to many state, orientation, and attention measures. The infant, who is alert and responds to auditory cues, subsequently looks at the mother a great deal. Similarly, infant tactile and auditory responsivity relate to subsequent measures of self-quieting behavior, hand-to-mouth contact, and cuddliness. Thus, further validation is offered for the Brazelton Neonatal Assessments as stable and possibly predictive measures of infant development.

Another major finding, which requires further study, concerns the interactive relationship between infants and mothers. Mothers' and infants' behaviors relate to each other in frequently logical ways. The attentive, sensitive mother tends to have a responsive baby, or the responsive baby tends to pull attentive, sensitive behaviors from the mother. There are consistent relationships between general and specific patterns of maternal stimulation and infant behavior in the corresponding

areas. Because the study is a correlative one, possible maternal effects upon infant behavior and possible infant effects upon maternal behavior cannot be defined. Further controlled research is needed to determine in which directions the effects are occurring. Although some work in this area has been done previously with infants and older children (Bell, 1968, 1971; Harper, 1971; Osofsky and O'Connell, 1972; Yarrow, 1965, 1971), much more information is obviously needed concerning both infants and neonates. However, it may be noted that the consistency between the initial Brazelton Neonatal Assessment parameters and the subsequent infant behavioral parameters at least suggests a significant infant, as well as maternal, role in determining the mother-infant relationship.

In conclusion, the results of the present study appear to further demonstrate the usefulness of the Brazelton Neonatal Assessment scale for gaining a greater understanding of infant development. The validity of the scale has been supported by independent behavioral observation. The relationships between the infant characteristics and the subsequent maternal and infant behaviors have been informative and seem to provide important data about the progressive course of events. Much more work clearly is necessary in order to understand better both early infant development and the growing mother-infant relationship. Relatively little information is as yet available concerning neonatal characteristics and later development. The possible effects of infant characteristics and development upon the mother-child relationship, while very important, remain virtually unstudied. Hopefully, further investigation will provide needed information in these areas.

Footnotes

[1]This research was supported in part by Grant No. 03-H-000-079-03-0, Maternal and Child Health Service, HSMHA, HEW. Appreciation is expressed to Edward J. O'Connell for his assistance with the design and statistical analyses, and Deborah Spitz for her help with the testing of subjects. Portions of this paper were presented at the biennial meeting of the Society for Research in Child Development, March, 1973.

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[3]The manual for these scales is available from the senior author.

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TABLE 1

Means and Standard Deviations on Medical Data

Variable	Mean	Standard Deviation
Length of labor (hours)	10.74	7.48
No. doses medication (labor) (range 1-9)	4.91	2.45
Anesthesia (none-much) (range 1-5)	2.09	1.04
Weight at birth (lb.)	6.89	0.99
Length at birth (cm.)	49.92	2.53
Apgar 1 minute	8.48	1.15
Apgar 5 minutes	9.71	0.54

TABLE 2

Means and Standard Deviations of Brazelton Measures

Variable (Range 1-9)	Mean	Standard Deviation
Initial state	1.70	0.78
Predominant state	4.58	0.83
Habituation--light	3.41	3.17
--rattle	3.06	3.27
--bell	2.14	2.96
--pinprick	1.13	1.51
Orientation--ball	3.38	2.08
--rattle	5.50	1.56
--face	4.32	2.70
--face and voice	5.22	2.63
Alertness	5.16	2.22
Tone	5.49	0.97
Motor maturity	5.24	2.28
Pull-to-sit	4.31	2.04
Cuddliness	4.37	1.86
Defensive movements	6.33	1.64
Consolability	4.98	1.97
Peak of excitement	6.90	1.02
Rapidity of build-up	4.53	1.62
Irritability	5.70	1.69
Activity	5.53	1.29
Tremulousness	5.57	2.80
Startle	3.27	1.64
Lability of states	4.06	1.84
Self-quieting	4.92	2.73
nd-to-mouth	6.47	1.98

TABLE 3

Means and Standard Deviations on Maternal and Infant Observations

Variable	Mean	Standard Deviation
Maternal Behaviors (Range 1-7)		
Attentiveness; general sensitivity	4.29	1.42
Frequency — auditory stimulation	2.20	1.40
Frequency — eye contact	5.69	1.42
Quality — auditory stimulation	3.10	2.02
Head and eye movement	3.88	1.54
Tactile stimulation	3.55	1.84
Infant Behaviors (Range 1-7)		
Initial state	3.67	1.82
Predominant state	3.16	0.96
Eye contact best	3.57	2.25
Eye contact predominant	2.59	1.71
Best auditory responsivity	1.92	1.35
Predominant auditory responsivity	1.85	1.72
Response to holding	4.76	1.05
Visual response to tactile stimulation	1.97	1.08
Motor response to tactile stimulation	1.53	0.74

TABLE 4

Relationships Between Brazelton Assessments and Infant Behavior

Brazelton Measures	Infant Behavior: Init. State	Predom. State	Best Eye Cont.	Predom. Eye Cont.	Best Audit. Resp.	Predom. Audit. Resp.	Resp. to Hold Tact.	Tact. Resp.- Non-Func.	Total Tact. Resp. Func. & Non-func.
Init. state		.27		.28		.49	-.26		
Predom. state		.37		.42		.31			
Orient.-ball	-.24	.30	.31	.26					
Orient.-rattle		.34		.33					
Orient.-eye		.25		.34					
Orient.-voice									
Orient.-voice and eye			.27	.24			.24		
Alertness		.34		.33					
Tone				-.39	-.37				-.40
Motor maturity		.30							
Pull-to-sit		.26				.36			
Cuddliness				-.28		-.26	.26		-.31
Defen. mov't						.39			
Consolability				.26	.28	.36			
Peak of excit.						.27	.26		
Rapid. build-up									-.30
Irritability				.30					
Activity	.26	.30				.24			
Tremulousness									
Startle		-.32				-.24			.32
Lability states		-.31				.39		.50	
Self-quieting		.28			.29	.70		.29	-.46
Hand-to-mouth				.26	.27	.44			-.59

$r = .231$ for $p < .05$; $r = .322$ for $p < .01$.

TABLE 5

Relationships between Infant and Maternal Behaviors

Infant Behavior	Maternal Behavior: Attentive. and Sensitivity	Auditory Stimulat.	Visual Stimulat.	Quality Auditory	Facial Mov't	Tactile Stimulat.
Initial state			.30			
Predom. state						
Best eye contact						
Predom. eye contact	.26					.31
Best audit. resp.		.61		.56		.41
Predom. audit. resp.	.30	.72	.36	.72	.36	.45
Resp. to holding					.30	
Tactile resp. (non-func.)						
Tactile resp. (func. & non-func.)	.46		-.61		.47	.43

Note: $r = .231$ for $p < .05$; $r = .322$ for $p < .01$.